



DECLARATION

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do hereby solemnly and sincerely declare:-

- 1) THAT I am well acquainted with the Japanese language
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- 2) THAT the attached is a full, true, accurate and
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The undersigned declares further that all
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Signed this 6th day of September , 2005 .



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[Title of the Invention] RECORDING AND PLAYBACK
APPARATUS FOR STREAM DATA AND
TRANSMISSION METHOD FOR STREAM
5 DATA

[Scope of Claim for a Patent]

[Claim 1]

A stream data recording and playback apparatus
comprising:

10 interface means for transmitting and receiving
stream data and data for control;

a built-in or removable recording medium for
recording received data;

encrypting means for performing a scramble
15 process of data to be transmitted; and

decrypting means for performing a de-scramble
process of the received data,

whereby key information for the scramble
process or de-scramble process is interchanged by
20 performing, through said interface means, an
authentication process between the present apparatus and
another apparatus for transmission or reception of
stream data, data obtained by controlling the de-
scramble process in accordance with copy control
25 information added to the received stream data and
information based on the copy control information are

recorded on said recording medium, and stream data
obtained by controlling the scramble process by said
encrypting means in accordance with the information
based on the copy control information read out of said
5 recording medium and the copy control information are
transmitted through said interface means,

wherein when the data de-scrambled by said
decrypting means and thereafter recorded on said
recording medium is read, scrambled by said encrypting
10 means and transmitted as stream data from said interface
means, the copy control information added to said stream
data to be transmitted is changed depending on whether
said data remains to be kept on said recording medium
even after said data is read out or said data is deleted
15 from said recording medium after said data is read out.

[Claim 2]

A stream data recording and playback apparatus
according to claim 1,

wherein when said data is deleted after read
20 out of said recording medium, said data is added with
the same copy control information as that added when
said data is recorded and is then transmitted as stream
data from said interface means and when said data
remains to be kept, stream data transmitted from said
25 interface means is added with copy control information
indicating that said stream data is prohibited from
being recorded and is then transmitted.

[Claim 3]

A stream data recording and playback apparatus comprising:

interface means for transmitting and receiving stream data and data for control;

5 a built-in or removable recording medium for recording received data;

encrypting means for performing a scramble process of data to be transmitted; and

10 decrypting means for performing a de-scramble process of the received data,

whereby a channel is established which is adapted to transmit the stream data onto a bus signal line connected to said interface means to permit data to be interchanged between the present apparatus and
15 another apparatus, key data is interchanged which is necessary for carrying out authentication between the present apparatus and the transmission destination apparatus so as to cause said encrypting means to perform a scramble process of data to be transmitted on
20 said channel or so as to cause said decrypting means to de-scramble the data, data obtained by controlling the de-scramble process in accordance with copy control information added to the received stream data and information based on the copy control information are
25 recorded on said recording medium, and stream data obtained by controlling the scramble process by said encrypting means in accordance with information based on the copy control information read out of said recording

medium and the copy control information are transmitted through said interface means,

wherein the data recorded on said recording medium is subjected to the scramble process by using
5 said key data by means of said encrypting means and thereafter transmitted as stream data from said interface means through said channel, said data is deleted from said recording medium after read out, and authentication between the present apparatus and an
10 apparatus other than the transmission destination apparatus is rejected during the transmission of said stream data.

[Claim 4]

A stream data recording and playback apparatus
15 comprising:

interface means for transmitting and receiving stream data and data for control;

a built-in or removable recording medium for recording received data; and

20 encrypting means for performing a scramble process of data to be transmitted and decrypting means for performing a de-scramble process of the received data,

whereby a channel is established which is
25 adapted to transmit stream data onto a bus signal line connected to said interface means to permit data to be interchanged between the present apparatus and another apparatus, key data is interchanged which is necessary

for carrying out authentication between the present
apparatus and the transmission destination apparatus so
as to perform a scramble process of data to be
transmitted on said channel or so as to de-scramble the
5 data, data obtained by controlling the de-scramble
process in accordance with copy control information
added to stream data received by said interface means
and information based on copy control information are
recorded on said recording medium, stream data obtained
10 by controlling the scramble process by information based
on the copy control information read out of said
recording medium and said copy control information are
transmitted through said interface means,

wherein when the data read out of said
15 recording medium is to be deleted after read out, a
second channel other than the channel that has already
been established is established, key data is
interchanged which is necessary for carrying out
authentication between the present apparatus and the
20 transmission destination apparatus so as to perform a
scramble process of data to be transmitted on said
second channel or so as to de-scramble the data, the
data recorded on said recording medium is subjected to
the scramble process by using said key data and
25 thereafter transmitted as stream data from said
interface means through said second channel while being
added with the same copy control information as that
used when said data is recorded, and authentication

tried by another apparatus to possess in common the key data used for said second channel is rejected during the stream data transmission on said second channel.

[Claim 5]

5 A stream data recording and playback apparatus according to claim 4,

 wherein when said second channel is established, the channel that has already been established for transmission of the stream data is
10 broken and stream transmission by only the second channel is carried out.

[Claim 6]

 A stream data recording and playback apparatus according to claim 4,

15 wherein when said second channel is established, an empty packet is transmitted to the channel that has already been established for transmission of the stream data and stream transmission by only the second channel is carried out.

20 [Claim 7]

 A stream data recording and playback apparatus according to claim 4,

 wherein two channels of said second channel and said already established first channel are used to
25 transmit stream data to be transmitted from said second channel by adding it with the same copy control information as that used when said data is recorded and to transmit stream data to be transmitted from said

first channel by adding it with copy control information indicating that said stream data is prohibited from being recorded.

[Claim 8]

5 A stream data recording and playback apparatus according to claim 4 or claim 7,

 wherein stream data is transmitted from said second channel to a recording apparatus for recording stream data and stream data is transmitted from said
10 already established channel to a display apparatus for playing back and displaying stream data.

[Claim 9]

 A stream data recording and playback apparatus according to claim 3 or claim 4,

15 wherein when the data recorded on said recording medium is read and deleted, a command for inquiring the transmission destination apparatus about its operation status is transmitted repetitively, so that when it is confirmed by a response to said command
20 that the transmission destination apparatus records the received stream, the data transmitted till then is deleted from said recording medium and when it is detected that said transmission destination apparatus interrupts the recording operation or when the
25 transmission of the stream data fails to proceed, reading of the data is stopped and the data remaining on said recording medium at that moment is held as it is.

[Claim 10]

A stream data recording and playback apparatus according to claim 3,

wherein a channel for transmitting said stream data is established, authentication is carried out
5 between the present apparatus and said transmission destination apparatus, a search for starting position of the data to be transmitted to said transmission destination apparatus is carried out, a command for commanding said transmission destination apparatus to
10 start recording is transmitted and a stream applied with a scramble process beginning with a head portion of said data subject to the search of starting position is transmitted to said channel.

[Claim 11]

15 A stream data recording and playback apparatus according to claim 10,

wherein a command for commanding said transmission destination apparatus to pause recording after reading of data being transmitted to said
20 transmission destination apparatus ends is transmitted to said transmission destination apparatus, a search for starting position of data to be transmitted next to said transmission destination apparatus is carried out, a command for commanding said other transmission
25 destination apparatus to start recording is transmitted to said other transmission destination apparatus, and a stream applied with a scramble process beginning with a head portion of said data subject to the search for

starting position is transmitted to said channel.

[Claim 12]

A stream data recording and playback apparatus according to claim 3 further comprising:

5 display means for displaying operation methods,

wherein a channel for transmitting said stream data is established, authentication is carried out between the present apparatus and said transmission destination apparatus, a search for starting position of data to be transmitted to said transmission destination apparatus is carried out, a message for causing said transmission destination apparatus to start recording is displayed by means of said display means, a stream
10 applied with a scramble process beginning with a head portion of said data subject to the search for starting position is transmitted to said channel by an operation from the user.

[Claim 13]

20 A stream data recording and playback apparatus having interface means for transmitting and receiving stream data and copy control information data, whereby key information for a scramble process or a de-scramble process is interchanged by performing an authentication
25 process between the present apparatus and another apparatus for transmission or reception of stream data and the stream data is recorded on or played back from a built-in or removable recording medium,

wherein when received data is recorded on the recording medium after decrypted and de-scrambled and the recorded data is read out, encrypted and scrambled so as to be transmitted as stream data from said

5 interface means, copy control information added to said stream data to be transmitted is changed depending whether said data remains to be kept on said recording medium even after read out or said data is deleted from said recording medium after read out.

10 [Claim 14]

A stream data recording and playback apparatus according to any one of claims 1, 3, 4 and 13,

wherein said built-in recording medium is a hard disc drive.

15 [Claim 15]

A stream data recording and playback apparatus according to any one of claims 1, 3, 4 and 13,

wherein said removable recording medium is a record erasable optical disc.

20 [Claim 16]

A method of transferring stream data used in a stream data recording and playback apparatus having interface means for establishing a channel for data transmission between the present apparatus and another
25 apparatus to transmit/receive stream data and data for control, a built-in or removable recording medium for recording received data, encrypting means for performing a scramble process of data to be transmitted and

decrypting means for performing de-scramble process of received data, whereby key information for the scramble process or de-scramble process is interchanged by performing an authentication process between the present
5 apparatus and the different apparatus for transmission and reception of stream data, data obtained by controlling the de-scramble process in accordance with copy control information added to the received stream data and information based on the copy control
10 information are recorded on said recording medium and stream data obtained by controlling the scramble process in accordance with information based on the copy control information read out of said recording medium and the copy control information are transmitted through said
15 interface means, said stream data transfer method comprising the steps of:

creating key data for performing a scramble process of data read out of said recording medium and establishing a channel for data transmission necessary
20 to transmit stream data from said interface means;

performing authentication between the present apparatus and a stream data transmission destination apparatus to cause said apparatuses to possess said key data in common, scramble-processing data read out of
25 said recording medium by using said key data by means of said encrypting means and transmitting the scrambled data as stream data from said interface means onto said data transmission channel while adding copy control

information to that data; and

rejecting common possession of said key data
based on a request for authentication made by an
apparatus other than said transmission destination
5 apparatus during transmission of the stream data carried
out by using said transmission channel and after the
transmission of the stream data ends, deleting from said
recording medium the data read out of said recording
medium and transmitted and braking said transmission
10 channel and said key data.

[Claim 17]

A stream data transfer method according to
claim 16 further comprising the steps of:

transmitting repetitively to said transmission
15 destination apparatus a command for inquiring about its
operation status during transmission of said stream
data;

when it is confirmed from a response to said
command that said transmission destination apparatus
20 records the received stream, deleting data transmitted
till then from said recording medium; and

when it is detected that said transmission
destination apparatus pauses recording operation or the
transmission of the stream data fails to proceed,
25 stopping reading of the data and holding data remaining
on said recording medium at that moment as it is.

[Claim 18]

A stream data transfer method according to

claim 16,

wherein after the channel for transmission of stream data to the transmission destination apparatus is established and authentication between the present
5 apparatus and said transmission destination apparatus is carried out, a command for starting recording operation is transmitted to said transmission destination apparatus in synchronism with start of the transmission beginning with a head portion of data to be transmitted
10 to said transmission destination apparatus so as to cause said transmission destination apparatus to record said data beginning with its head portion.

[Claim 19]

A stream data transfer method according to
15 claim 16,

wherein after the channel for transmission of stream data to the transmission destination apparatus is established and authentication is carried out between the present apparatus and said transmission destination
20 apparatus, an indication for causing said destination apparatus to perform recording operation is given to the user, and the data to be transmitted to said transmission destination apparatus is made ready to start beginning with its head portion in response to the
25 user operation and thereafter said transmission destination apparatus is caused to record said data beginning with its head portion.

[Detailed Description of the Invention]

[0001]

[Technical Field Pertinent to the Invention]

The present invention relates to a stream data
5 recording and playback apparatus for recording and
playback of stream data such as digital video/audio
signals and a method for transfer of data in the stream
data recording and playback apparatus.

[0002]

10 [Prior Art]

With the development of digital video signal
processing techniques and recording and playback
techniques, settop boxes (STB's) for reception of
satellite broadcast or CATV, digital broadcast receiver
15 sets such as digital TV's, digital VTR's, disk recorders
and the like have been realized as household
apparatuses. When a video/audio signal is transmitted
and received between the digital AV apparatuses, it is
desirable for the purpose of preventing degradation in
20 signal quality that the signal be transmitted as stream
data while keeping the digital signal format. Available
as a digital interface optimized for transmission of
such stream data is a fast serial bus defined by IEEE
1394-1995 standards, which bus will hereinafter be
25 referred to as a 1394 bus. The 1394 bus meets
conditions for connection of the AV apparatus by
permitting maximal 63 devices to be connected freely in
tree connection and by being provided with an

isochronous transfer scheme that has a maximum transfer rate of 400Mbps and is suitable for transmission of data necessary to be transmitted on real time such as a video/audio stream.

5 [0003]

 In the recording and playback apparatus such as a digital VTR, on the other hand, recording/playback of signals is carried out digitally, so that a change in signal quality attributable to repetitive
10 recording/playback operations does not occur essentially and copies identical to an original can be created easily many times. This will give rise to a possibility that many copies duplicate to an original can be reprinted, amounting up to a great number of copies in
15 excess of the range of domestic use, even in the case of video/audio data (contents) conserved for copyright.

 [0004]

 As a technique for prevention of the unauthorized copy of contents, a DTCP (Digital
20 Transmission Contents Protection) scheme has been adopted in the 1394 bus. In the DTCP scheme, data for authentication is assigned to AV apparatuses, one by one, for handling a video/audio stream with copyright reserved, that is, a broadcast receiver set, a recording
25 and playback apparatus and a display apparatus, a stream applied with a scramble process is sent from an apparatus on the stream transmitting side (hereinafter referred to as a source device) in order that

transmission of data is permitted between only
apparatuses that succeed in mutual authentication and an
apparatus on the stream receiving side (hereinafter
referred to as a sink device) that has acquired key data
5 for release of the scramble in advance on the basis of
the authentication receives and decodes the stream to
play back or record the stream.

[0005]

The video/audio stream is assigned with copy
10 control information describing conditions for copying of
data and data copying is sorted into any of three modes
of "copy free", "copy never" and "copy one generation".
The recordable apparatus such as the digital VTR is
permitted to receive and record only a stream subject to
15 "copy free" or "copy one generation" and after having
recorded a stream subject to "copy one generation", it
changes the copy control information to "no more
copies". The apparatus for playback and display of
video/audio signals such as the digital TV can receive
20 and plays back streams regardless of the copy control
information.

One may refer to, for example, JP-A-11-205310
as describing the aforementioned technique.

[0006]

25 [Problem to be solved by the Invention]

In the DTCP scheme, once contents subject to
"copy one generation" is recorded on the recording and
playback apparatus, copy control information for the

contents is thereafter changed to "no more copies", thus inhibiting other recording apparatus from recording the contents any more. On the other hand, a stream recording/playback apparatus for recording video/audio stream data by using a hard disc drive (HDD), such as a so-called HDD recorder", has recently been realized. In the HDD recorder, the drive is fixed in the apparatus and the capacity is limited and therefore, from the standpoint of easy-to-handle operation, it is desirable that the user delete contents once played back and unnecessary to be conserved thereafter from the disk, keep contents desired to be played back later in the disk and with the empty capacity of the disk lessened, transfer the contents to be kept to a VTR or optical disc apparatus so that the contents may be stored in a holding medium such as a tape or optical disc.

[0007]

In the copyright protection method described as above, contents once recorded in the recording medium is managed as "no more copies" and consequently, cannot be copied again to the holding medium, with the result that conservation by the user as described above cannot be realized.

An object of the present invention is to provide a stream data recording and playback apparatus capable of permitting the user to transcribe contents from a primary storage medium to a holding medium while protecting copyright of the contents.

[0008]

[Means for Solving the Problem]

According to the invention, to accomplish the above object, when contents temporarily stored in a stream recording and playback apparatus is played back with the aim of transcribing the contents to a different recording apparatus, authentication of apparatus is made mutually between the stream recording and playback apparatus and the different recording apparatus to interchange key data for contents scramble so as to enable the apparatuses to possess the key data in common. Then, stream data scrambled using the key data is transmitted to the recording apparatus by designating one transmission channel and at the time that the contents transmission ends, the contents is deleted to thereby implement transcription of the contents. During the execution of transcription, a request for authentication made by a different receiving apparatus to that channel is rejected to ensure that the contents cannot be received at a time by a plurality of apparatuses.

[0009]

[Mode for Carrying Out the Invention]

Embodiments of the present invention will now be described with reference to the accompanying drawings. Referring first to Fig. 1, there is illustrated an AV system constructed by using a hard disc recorder representing an embodiment of a stream

data recording and playback apparatus according to the invention. The AV system comprises a digital satellite broadcast receiver set 3, a digital TV 4, a hard disk recorder 1 and a digital video tape recorder 2. These
5 devices are coupled to each other through a 1394 bus.

[0010]

In the digital satellite broadcast receiver set 3, a signal received by an antenna 31 is demodulated by means of a front end 32, desired program data is
10 selected from a multiplexed transport stream at a demultiplexer 33 and the selected data is delivered as a stream from an interface 35 onto the bus through a terminal 36. A CPU 34 executes programs stored in a built-in memory or a memory, not shown, so as to control
15 individual components of the digital satellite broadcast receiver set 3. Further, the CPU 34 conducts such processes as reading electronic program guide (EPG) information from the received transport stream to create screen data for operation inclusive of screen data for
20 presenting the read information to the user and transmit the screen data to the 1394 bus and transmitting/receiving control commands through the 1394 bus.

[0011]

25 In the digital TV 4, the stream transmitted on the 1394 bus is received by an interface 42 through a terminal 44a or 44b, the received stream is decoded to video and audio data by means of a decoder 43 and video

data is displayed on a CRT 46 through a signal processing circuit 45. Audio data, on the other hand, passes through an audio signal processing circuit, not shown, so as to be reproduced from a loudspeaker, not shown. A CPU 41 executes programs stored in a built-in memory or a not-shown memory to control individual components of the digital TV 4. Further, the CPU 41 receives screen data for controlling other apparatus connected through the medium of the 1394 bus to draw the data in a memory included in the signal processing circuit 45 so as to display that data or transmits/receives commands for controlling other devices.

[0012]

In the disk recorder 1, a stream transmitted on the 1394 bus is received by means of an interface 14 through a terminal 15a and the received stream is converted into a data format for write to a disk 11 by means of a signal processing circuit 13 and recorded on the disc 11. Conversely, a signal read out of the disk 11 is converted into a stream format for transfer by means of the signal processing circuit 13 and then transmitted as a stream from the interface 14 onto the 1394 bus through terminal 15a or 15b. A CPU 12 executes programs stored in a built-in memory or a not-shown memory to control individual components of the disk recorder 1. Further, the CPU 12 conducts such processes as preparing screen data indicative of operation contents of the disk device 1 to transmit the data to

the 1394 bus and transmitting/receiving control commands through the 1394 bus.

[0013]

In the digital VTR 2, a stream transmitted on
5 the 1394 bus is received by an interface 22 through a terminal 26. The received stream is converted into a format of recording onto a tape medium by means of a signal processing circuit 23 and recorded on a tape 25 from a head 24 mounted to a rotary drum not shown.
10 Conversely, data read out of the tape 25 by means of the head 24 is converted into a stream format for transfer by means of the signal processing circuit 23 and is then transmitted from the interface 22 to the 1394 bus through the terminal 26. A CPU 21 conducts such
15 processes as executing programs stored in a built-in memory or a not-shown memory to control individual components of the digital VTR 2, preparing screen data indicative of operation contents of the digital VTR 2 to transmit it to the 1394 bus and transmitting/ receiving
20 commands for control through the 1394 bus.

[0014]

Referring to Fig. 2, detailed construction of the interfaces 14, 22, 35 and 42 is illustrated. The individual interfaces are implemented with the
25 construction common to the individual sections. A physical layer processor (PHY) 54 connecting to the 1394 bus and a link layer processor (LINK) 53 respectively execute physical layer and link layer processes

prescribed by the IEEE 1394 standards, the input/output of the link layer processor 53 is connected to an isochronous transfer FIFO 52 for storing data transferred on the 1394 bus in the isochronous transfer mode and to
5 an asynchronous transfer FIFO 55 for storing data transferred on the 1394 bus in the asynchronous transfer mode, and the input/output of the isochronous transfer FIFO is applied, as necessary, with a scramble process or a de-scramble process by means of a data
10 encrypting/decrypting means 51 and thereafter connected to, for example, the signal processor inside the device. The input/output of the isochronous transfer FIFO 55 is connected to the CPU inside the device through a host interface 56. The CPU transmits/receives control
15 commands transmitted/ received to/from the 1394 bus in the asynchronous transfer mode and besides, controls the individual components of the interface through the host interface 56.

[0015]

20 Next, operation of the AV system shown in Fig. 1 will be described. Firstly, in case programs broadcasted by digital satellite broadcasting are received by means of the digital satellite broadcast receiver set 3 and watched and listened by means of the
25 digital TV 4, a desired program is selected in the digital satellite broadcast receiver set 3, the selected program is sent as a stream onto the 1394 interface and the stream is received by the digital TV 4 so as to be

played back and displayed. For the 1394 bus, two modes of isochronous transfer and asynchronous transfer are prescribed. When the stream of broadcasting program is transferred on real time, the isochronous transfer mode
5 is typically used. For control of the transmission format of stream data and of the stream transmission/reception, a method prescribed by the IEC 61883 standards may be used.

[0016]

10 Fig. 3 shows a logical connection form when stream data is transmitted from the digital satellite broadcast receiver set to the digital TV in accordance with the stream data transmission control method prescribed in the IEC 61883 standards. In the IEC 61883
15 standards, an input/output port for virtual stream data called "plug" is provided and a "connection" representing the logical connection is established between plugs so as to prescribe stream data transmitting and receiving apparatuses.

20 [0017]

An example of Fig. 3 shows that an output plug 301 of the digital satellite broadcast receiver set 3 is connected to an input plug 401 of the digital TV 4 by using an isochronous data channel X on the 1394 bus and
25 stream data is transmitted by using this channel X. Control of stream data transmission and reception is executed by carrying out write to plug control registers provided in bus address spaces of the individual devices

connected to the 1394 bus. For example, a connection is established by writing a transmission channel X, as a setting value, from the digital TV 4 to an output plug register of the digital satellite broadcast receiver set
5 3 and causing the digital TV to set an input plug register of its own to reception of the channel X, thereby enabling the satellite broadcast receiver set 3 to transmit a stream to the digital TV 4 by using the channel X.

10 [0018]

The connection can be established from the digital TV 4 side, that is, from the sink side as described above but alternatively, the connection establishment can be accomplished from the satellite
15 broadcast receiver set, that is, from the source side. In addition, the connection can also be established by transmitting a command for connection establishment from the source side to the sink side. When the stream data transmission ends, the established connection is broken
20 by writing data for releasing the connection using the channel X to the input plug register and output plug register of each device. It is to be noted that in the IEC61883 standards, a point to point connection for connecting the input and output plugs and a broadcast
25 connection for connecting input or output plug and the isochronous data channel are defined but the point to point connection is simply referred to as "connection" in the foregoing and will hereinafter be done so unless

noticed in particular.

[0019]

Next, operation when the disk recorder 1 records satellite broadcast programs will be described.

5 In this case, as shown in Fig. 4, a connection is established between the output plug 301 of satellite broadcast receiver set 3 and an input plug 101 of disk recorder 1 and a stream of a program is transmitted and recorded on the disk in the disk recorder 1. At that

10 time, a so-called recording monitor can be carried out in which the stream of the same channel X is received by means of the digital TV 4 so that an image of the stream being recorded on the disk recorder may be decoded and displayed.

15 [0020]

In the IEC61883, it is possible to add a connection to the connection established precedently so as to permit another apparatus to also use the stream of the same channel. This subsequent addition of

20 connection is called "overlay". As shown in Fig. 4, a connection is established between the output plug of digital satellite broadcast receiver set 3 and the input plug 401 of digital TV 4. In this case, it is also possible to overlay the connection to the input plug 101

25 of disk recorder 1 on the connection initially established to transmit a stream from the digital satellite broadcast receiver set 3 to the digital TV 4 for watching and listening the stream. Alternatively,

it is possible to overlay the connection to the input of digital TV 4 on the connection from the digital satellite broadcast receiver set 3 to the disk recorder 1. As in the case of playback or watching and listening, the connection establishment may be carried out from the side of any one of the devices of satellite broadcast receiver set 3, digital TV 4 and disk recorder 1 or may be executed by a transmission destination apparatus by sending a command thereto.

10 [0021]

Various forms of operation conducted by the user when recording operation is performed can be considered. In one way, a command inputted by operating, for example, a remote controller while watching a GUI screen displayed on the digital TV 4 may be transmitted as a command from the TV to the digital satellite broadcast receiver set 3 and disk recorder 1 through the 1394 bus or the user operation may be realizable through a method in which a GUI screen created by the digital satellite broadcast receiver set 3 or disk recorder 1 is sent to the digital TV 4 so as to be displayed thereon and an operation is carried out by operating a remote controller or a panel on the side of digital satellite broadcast receiver set 3 or disk recorder 4 to perform recording.

[0022]

For a command for operating the digital satellite broadcast receiver set 3 or disk recorder 1

from the digital TV 4 or for establishing a connection to the transmission destination apparatus, an AV/C command set defined as command specifications for controlling AV apparatus by the 1394 Trade Association
5 may be used pursuant to command transfer protocol defined in the IEC61883 standards. As a method for transmission of the GUI screen to another apparatus, there is available a method defined in the EIA775A standards, a method using a panel sub-unit indicated by
10 the aforementioned AV/C command set specifications or a method for implementing a GUI defined in HAVi (Home Audio Video interoperability) specifications that define network control specifications of the AV apparatus.

[0023]

15 Next, an instance will be described in which broadcast programs recorded on the disk recorder 1 are played back so as to be displayed on the digital TV 4. Fig. 5 shows a transmission status of a stream when the stream is transmitted from the disk recorder 1 and
20 displayed on the digital TV 4. In this case, a connection is established from an output plug 102 of disk recorder 1 to the input plug 401 of digital TV 4 to permit the stream to be transmitted and the stream received by the digital TV 4 is decoded and displayed.
25 As in the case of playback and recording, various forms of the apparatus that establishes the connection and the method of operation by the user can be considered.

[0024]

In an instance where a stream is recorded or played back by means of the digital VTR 2, too, a connection is established as shown in Fig. 6 between an input plug 201 or output plug 202 of digital VTR 2 and the output plug 301 of digital satellite broadcast receiver set 3 or the input plug 401 of digital TV 4, like the instance of disk recorder, to permit transmission of the stream.

[0025]

10 The foregoing description has been given without considering a case where limitation on copy is applied to programs received through satellite broadcast. Thus, when a program received through, for example, satellite broadcast and recorded on the disk recorder is transmitted as a stream onto the bus and the stream is received by another disk recorder or digital VTR, the program can be copied. In each of the IEEE1394 standards and the IEC61883 standards, limitation is not particularly imposed on the apparatus allowed to transmit and receive the stream and therefore, a stream flowing on the bus can essentially be received and utilized by any other apparatus by overlaying the connection as described previously and one stream can be recorded simultaneously by means of a plurality of apparatuses to prepare many copies.

[0026]

Under the circumstances, when among broadcast programs, contents of movies for instance, for which

copyright is reserved to make it necessary to impose limitation on preparation of copies for the purpose of protecting the right of a copyright holder, is transmitted on the 1394 bus, the DTCP (Digital
5 Transmission Content Protection) scheme defining copyright protection specification on the 1394 bus is used with a view to preventing the contents as above from being copied unlimitedly.

[0027]

10 According to the DTCP scheme, when contents with copyright reserved with its copying limited is to be transmitted as a stream on the 1394 bus, mutual authentication between partner apparatuses is carried out by using information for authentication precedently
15 built in the apparatuses, contents is scrambled only when the authentication is successful to enable the partner apparatuses to mutually possess key data for transmission in common, a stream representative of encrypted contents is transmitted from the source
20 apparatus side onto the 1394 bus and the stream received by the sink side is decrypted by using the key processed in common, thereby ensuring that transmission/reception of the contents can be permitted only between the apparatuses having the information for
25 authentication.

[0028]

Fig. 7 shows transmission procedures when contents applied with limitation on copy is transmitted

from the digital satellite broadcast receiver set 3 to the disk recorder 1 in the AV system shown in Fig. 1. In Fig. 7, when a stream is to be transmitted from the satellite broadcast receiver set 3 to the disk recorder 1, a connection is first established between the output plug of satellite broadcast receiver set 3 and the input plug of disk recorder 1 as described previously (procedure 1001), key data for encrypting the contents is created by the satellite broadcast receiver set 3 representing the source side (procedure 1002) and the stream applied with a scramble process by the key data is started to be transmitted onto the bus (procedure 1003). When receiving the stream undergoing the scramble process, the disk recorder 1 representing the sink side makes a request for authentication to the source side (procedure 1004), so that partner authentication is mutually carried out between the source and sink sides to interchange the key data (procedure 1005). When the authentication is successful, the sink side is allowed to calculate the key data for contents encryption and calculates its value (step 1006), thus being permitted to decrypt and receive the stream transmitted from the source side (procedure 1007).

[0029]

To end the transmission of the stream, the stream from the source side is stopped (procedure 1008), the connection between the source and sink is broken

(procedure 1009) and the key data on the respective source and sink sides is broken (procedures 1010 and 1011). For limitation on copy of contents, there are provided four levels of "copy free", "copy never", "copy
5 one generation" and "no more copies" and these levels are identified by using copy control information. Fig. 8 shows a format of a data packet in the isochronous transfer mode used to transfer stream data on the 1394 bus. The packet consists of header information of 32
10 bits, a header CRC, a data field and a data CRC. The header information has a data length field of 16 bits indicating a length of the packet, a tag field used for identifying the packet data format, a channel field indicating an isochronous channel number used for
15 transmission of the packet, a Tcode indicating the kind of transaction of the packet and a Sy field (Sync) used for synchronization of data. Of these fields, the Sy field has upper two bits used to provide individual values representative of the aforementioned four levels,
20 so that the copy control information of contents transmitted in the form of a stream can be identified.

[0030]

Contents of or subject to "copy free" is freed from limitation on copy so as to be able to be freely
25 transmitted and received by any apparatus and need not be scrambled when transmitted/received to/from the bus. Contents of or subject to other three levels "copy never", "copy one generation" and "no more copies" is

applied with limitation on copy and needs to be scrambled when transmitted on the bus. Contents of "copy never" cannot be received by the recording apparatus such as the disk recorder or VTR and stored in
5 a medium. Therefore, for example, only when recording operation is not carried out as in such a case where a stream is transmitted from the satellite broadcast receiver set to the digital TV and played back or watched and listened, the transmitted stream can be
10 received. Contents of "copy one generation" is allowed to be recorded with the recording apparatus but in case the contents is once recorded and thereafter reproduced from the recording apparatus so as to be transmitted, the contents must be transmitted with its copy control
15 information changed to "no more copies". For the contents of "no more copies", only indication of created data is permitted as in the case of "copy never". In the apparatus having the information for authentication, the processing of contents conforming to the
20 aforementioned copy control information is correctly practiced without fail, thereby preventing contents subjected to limitation on copy from being copied without authorization in the DTCP scheme.

[0031]

25 Next, operation carried out when contents recorded on the disk recorder according to the embodiment of the invention is transcribed (or moved) to the digital VTR will be described. It is meant by

"transcription" that contents is moved from an apparatus on the source side to the sink side by transmitting the contents from the apparatus on the source side to an apparatus on the sink side, whereby the apparatus on the sink side records the received contents and at the same time, the apparatus on the source side having transmitted the contents deletes the contents or whereby after confirming that the apparatus on the sink side has recorded the received contents, the apparatus on the source side deletes the contents.

[0032]

Fig. 9 shows procedures for transmission of a stream when transcription is conducted. In this example, contents subject to "no more copies" recorded on the disk recorder 1 shown in Fig. 1 is transcribed to the digital VTR 2. When transcription of the contents to the digital VTR 2 is commanded to the disk recorder 1 through an operation of the panel or remote controller by the user or by reception of a command from another apparatus, the disk recorder 1 established a connection between the disk recorder 1 and the digital VTR 2 (procedure 1101), creates key data for scramble (procedure 1102) and starts transmission of a stream added with copy control information of "copy one generation" (procedure 1103). The stream at that time is not always a stream per se inclusive of the contents to be transcribed but may be a stream inclusive of, for example, a dummy blank signal. Receiving the stream,

the digital VTR 2 makes a request for authentication to the disc recorder 1 (procedure 1104) so as to carry out mutual partner authentication between the source and sink and when the authentication is successful between them (procedure 1105), the sink side is permitted to create the key data through calculation (procedure 1106) and the key data for scrambling the contents can be possessed in common. Subsequently, the disk recorder 1 transmits a command for placing the digital VTR 2 in recording condition (procedure 1107), performs a search for starting position of the contents to be transcribed (procedure 1108) and starts transmission of the stream added with the control information "copy one generation" by scrambling the contents, beginning with its head portion (procedure 1109). The digital VTR 2 receives and scrambles the transmitted stream to record it as information subject to "no more copies" on a tape (procedure 1110). Namely, the stream added with the copy control information when the stream is once recorded initially on the disk recorder 1 is transmitted to the digital VTR 2 and recorded thereon and thereafter, the stream is deleted from the disk recorder 1 representing an original recording medium.

[0033]

Instead of causing the digital VTR 2 to start recording by sending the command to the digital VTR 2, the panel or remote controller of digital VTR 2 may be operated to place the digital VTR 2 in recording

condition and thereafter the disk recorder 1 may be operated to start the stream transmission. At that time, by displaying a message of, for example, "Please place VTR in recording condition." in user interface
5 information created by the disk recorder to make the transmission start ready to be operated, an operation method can be presented to the user comprehensibly.

[0034]

During the contents transmission, the disk
10 recorder 1 periodically transmits a command to the digital VTR 2 to examine its operation status (procedure 1111) and checks that a response purporting that recording is in operation returns from the digital VTR 2 (procedure 1112). Then, if it is determined that the
15 recording operation continues normally, the contents the transmission of which has finished till then is deleted from the disk (procedure 1113). On the other hand, in the event that the recording operation of digital VTR 2 is stopped owing to an operation by the user or for
20 other reasons and the stoppage is detected by way of, for example, a response to the command or in the event that the connection between the disk recorder and digital VTR cannot persist for reasons such as draw-out or disconnection of the cable of 1394 bus, the
25 transmission of the stream is stopped and thereafter, the contents scheduled to be transcribed is held in the disk. By deleting the contents little by little during operation of transcription in this manner, the operation

can be stopped immediately before the end of transcription operation and the transcription operation can be recommenced from the beginning to prevent many sheets of copies from being prepared easily and to
5 prevent data desired to be transcribed from collapsing when recording of the contents cannot proceed in the digital VTR 2 for some reasons.

[0035]

In case a request for authentication is made
10 during the transcription operation by such a sink device other than the digital VTR 2 that has initially carried out the authentication as the digital TV, another digital VTR or another disk recorder (procedure 1114), the request is rejected (procedure 1115), thereby
15 preventing a plurality of copies from being created in addition to the transcription.

[0036]

When transmission of all contents to be transcribed ends, the disk recorder stops transmitting
20 the stream (procedure 1116), deletes contents remaining in the disk of disk recorder 1 (procedure 1117) and breaks the connection (procedure 1118). Through this, the key for contents scramble possessed in common by the two parties is broken (procedures 1119 and 1120) and the
25 transcription operation ends.

[0037]

In the manner described as above, the contents of "no more copies" recorded on the disk recorder 1 can

be transcribed to the digital VTR 2 while preventing the problem that the contents is recorded concurrently on other recording apparatus and a plurality of copies are created. On the other hand, the digital VTR 2 side need
5 not consider that the operation is transcription and may perform the same operation as normal recording of contents of "copy one generation". For contents of "copy free" not applied with limitation on copy, the transcription operation as above is not always necessary
10 and contents remaining after completion of normal copying may be deleted. But, if the contents is deleted little by little similarly to the transcription of the contents applied with limitation on copy as described above, the operation by the user can be simplified.

15 In case a plurality of write-once contents are designated precedently as to be transcribed, it suffices that after transmission of one contents ends, a command for placing the VTR once in pause condition may be transmitted, the pause may be released when the next
20 contents is ready to be transmitted and thereafter the transmission of the contents may be started. In this manner, occurrence of blanking between contents on the tape of digital VTR 2 can be prevented.

[0038]

25 Fig. 10 shows an operation status when transcription is executed while monitoring a stream transmitted from the disk recorder 1 to the digital VTR 2 by means of the digital TV 4. Firstly, a connection

is established between the output plug 102 of disk recorder 1 and the input plug 401 of digital TV 4 by using a channel X and through a panel operation or remote control operation of the disk recorder 1 or an operation of the digital TV 4 side from the control application, the contents of contents to be transcribed from the disk recorder 1 is confirmed and selected. Then, when the transcription to the digital VTR 2 is commanded to the disk recorder 1 through any one of the above methods, the disk recorder 1 establishes a new connection between an output plug 103 of disk recorder 1 and the input plug 201 of digital VTR 2 by using a channel Y other than the channel X used by the connection which has already been established between the disk recorder 1 and the digital TV 4 and executes a transcription operation with respect to the digital VTR 2 similarly to the procedures shown in Fig. 9. For practicing the transcription, the connection established with respect to the digital TV may be broken or the transmission of the stream may be stopped while holding the connection to continue transmission of an empty packet. Alternatively, a 1394 interface capable of performing simultaneous transmission of two channels may be used to transmit a stream subject to "no more copies" to the digital TV 4 while transmitting the same contents subjected to "copy one generation" to the digital VTR 4, thereby practicing transcription. In this case, the contents being transcribed can be monitored

simultaneously on the digital TV 4.

[0039]

A channel different from the connection that has already been established with respect to the digital TV, for instance, can be used in this manner, so that even when a recording apparatus other than the digital TV has already been overlay-connected to the same channel, contents to be transcribed to that recording apparatus can be prevented from being recorded.

Further, by using the 1394 interface capable of delivering two channels simultaneously, contents being transcribed can be monitored with the digital TV.

[0040]

In the foregoing examples, embodiments have been described in which the present invention is applied to the unitary disk recorder apparatus. The stream data recording and playback apparatus of the invention is not limited to the foregoing examples but may be a composite apparatus integrally formed of, for example, the satellite broadcast receiver set and the disc recorder and even in that case, the digital VTR can be connected with the 1394 bus to implement the transcription of contents in quite a similar way.

[0041]

The foregoing embodiments have been described by way of example of the recording and playback of the stream data exemplified by a multiplexed video and audio data stream but regardless of the kind of stream data,

the present invention can also be applied to a recording and playback apparatus for recording and playing back a stream of only image, a stream of only voice, a stream of data broadcast described by XML (eXtended Markup Language) or a stream resulting from multiplexing these streams.

[0042]

[Advantages of the Invention]

According to the invention, contents once recorded by the stream data recording and playback apparatus and subjected to limitation on copy can be transcribed to another stream data recording and playback apparatus and at that time, there is no fear of preparation of an unauthorized copy.

15

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a block diagram showing detailed construction of an AV system including a stream data recording and playback apparatus according to an embodiment of the invention.

[Fig. 2]

Fig. 2 is a block diagram showing detailed construction of interface means of the stream recording and playback apparatus according to an embodiment of the invention.

[Fig. 3]

Fig. 3 is a diagram showing a method for

transmission of data between a digital satellite broadcast receiving apparatus and a digital TV.

[Fig. 4]

Fig. 4 is a diagram showing a method for transmission of data between the stream recording and playback apparatus and the digital satellite broadcast receiving apparatus and digital TV according to an embodiment of the invention.

[Fig. 5]

Fig. 5 is a diagram showing a method for transmission of data between the stream recording and playback apparatus and the digital satellite broadcast receiving apparatus and digital TV according to an embodiment of the invention.

[Fig. 6]

Fig. 6 is a diagram showing a method for transmission of data between a digital VTR and the digital satellite broadcast receiving apparatus and digital TV.

[Fig. 7]

Fig. 7 is a diagram showing a sequence of procedures of data transmission between the stream data recording and playback apparatus and the digital satellite broadcast receiving apparatus according to an embodiment of the invention.

[Fig. 8]

Fig. 8 is a diagram showing a transmission packet format of stream data.

[Fig. 9]

Fig. 9 is a diagram showing a sequence of procedures of data transmission between the stream data recording and playback apparatus and another recording
5 apparatus according to an embodiment of the invention.

[Fig. 10]

Fig. 10 is a diagram showing a method for data transmission between the stream recording and playback apparatus and the digital satellite broadcast receiving
10 apparatus and digital TV according to an embodiment of the invention.

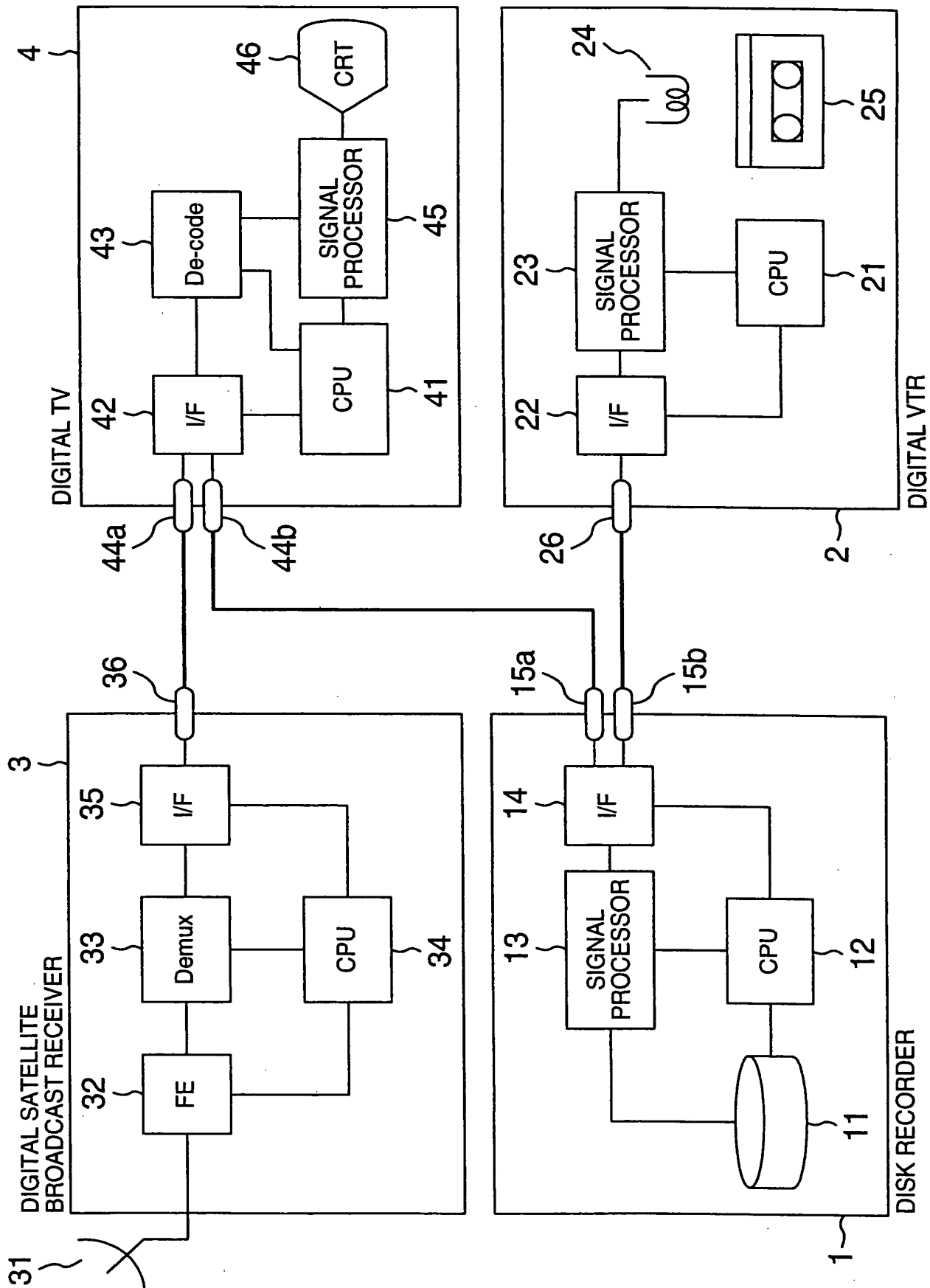
[Description of Reference Numerals]

- 1 . . . Disk recorder
- 2 . . . Digital VTR
- 15 3 . . . Satellite broadcast receiver
- 4 . . . Digital TV
- 11 . . . Hard disk
- 12, 21, 34, 41 . . . CPU
- 13, 23, 45 . . . Signal processor
- 20 14, 22, 35, 42 . . . Interface means
- 15a, 15b, 26, 36, 44a, 44b . . . Terminal
- 24 . . . Head
- 25 . . . Tape
- 31 . . . Antenna
- 25 32 . . . Front-end
- 33 . . . Demultiplexer
- 43 . . . Decoder

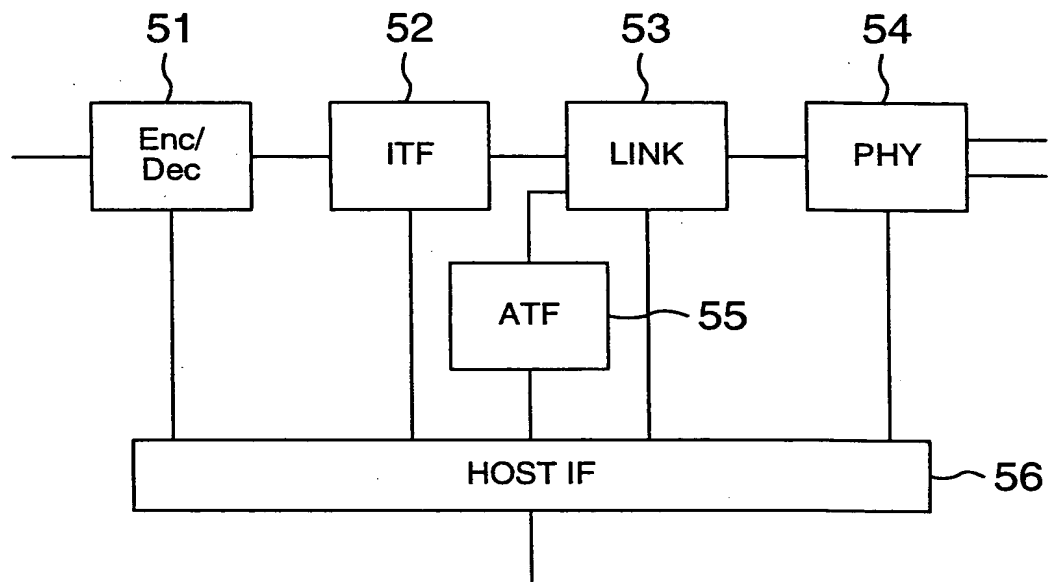
46 . . . CRT

51 . . . encrypting/decrypting means

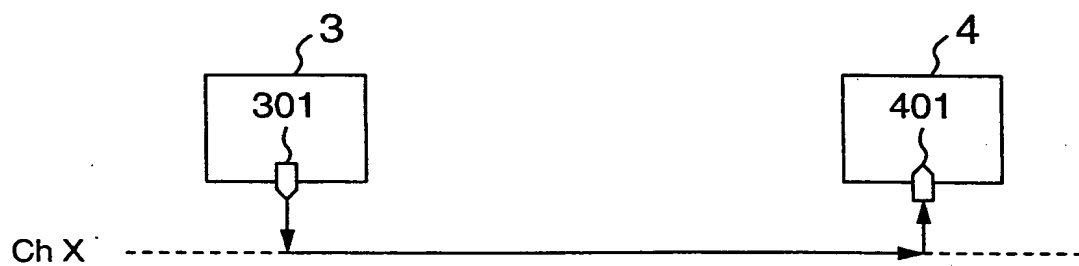
[Fig. 1]



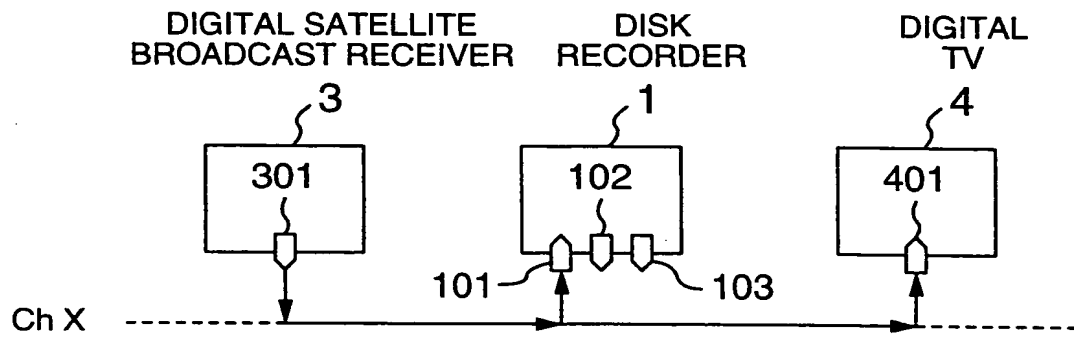
[Fig. 2]



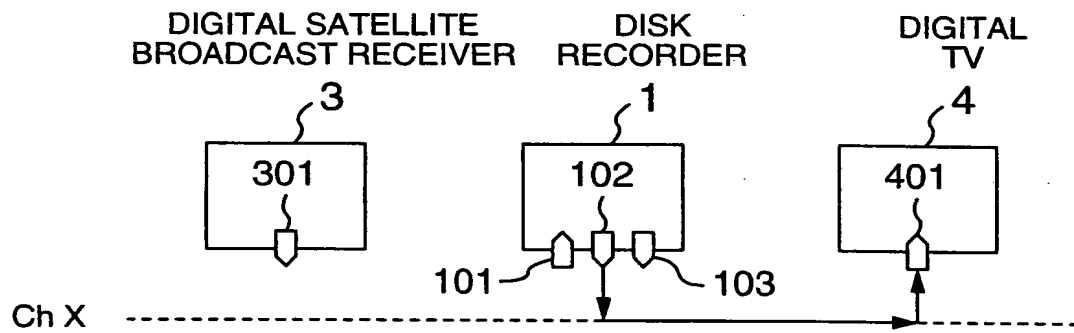
[Fig. 3]



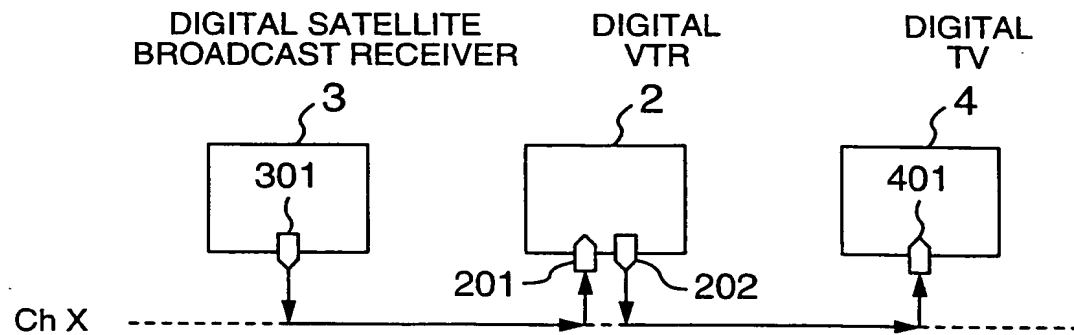
[Fig. 4]



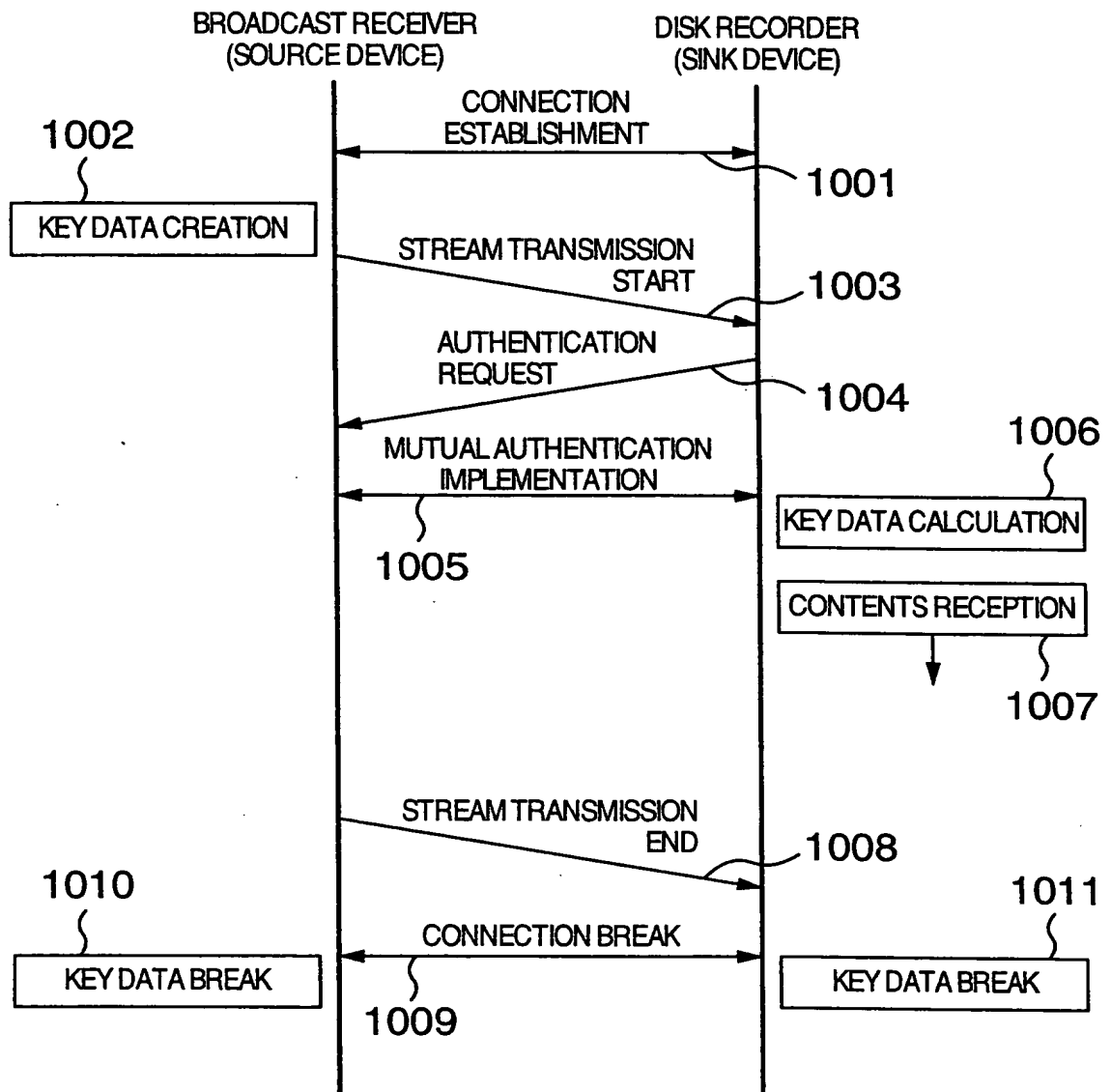
[Fig. 5]



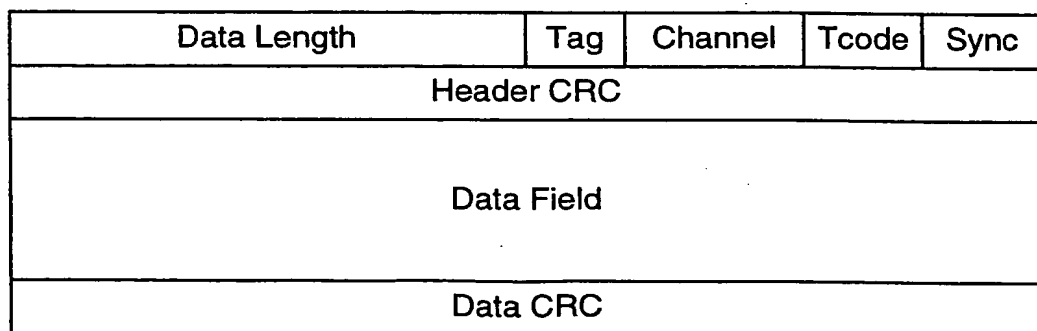
[Fig. 6]



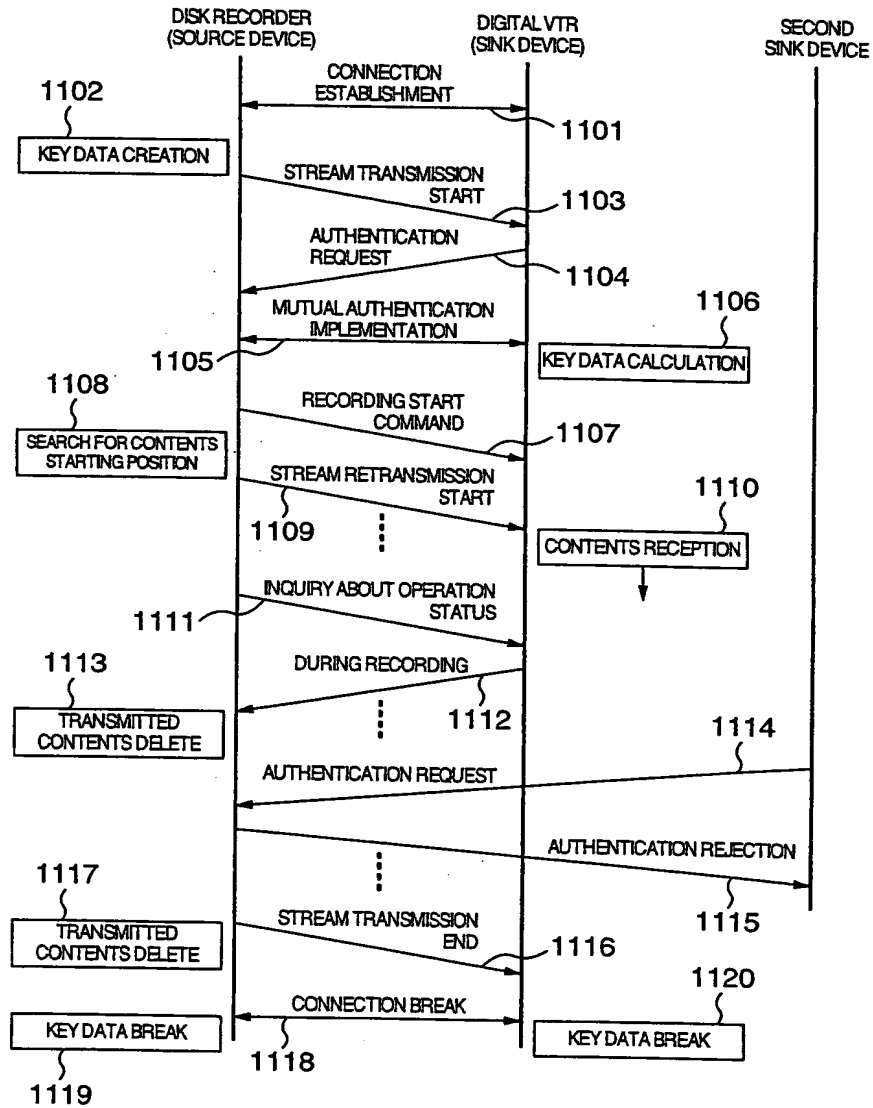
[Fig. 7]



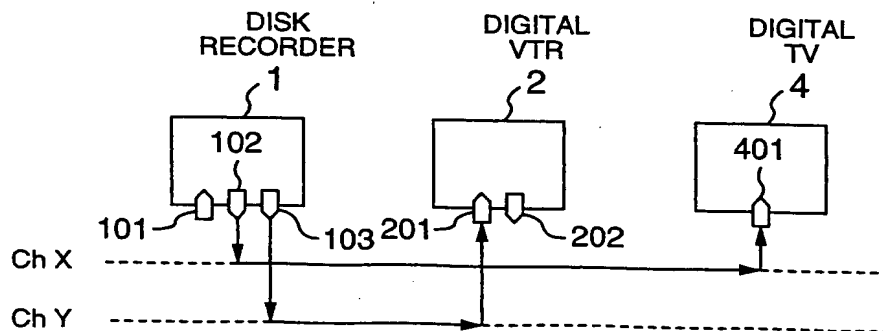
[Fig. 8]



[Fig. 9]



[Fig. 10]





[Kind of Document] Abstract

[Abstract]

[Problem] In transmission of stream data protected for copyright on a bus, transcription of stream data once recorded on a recording apparatus to a medium of another recording apparatus is realized.

[Solution] Authentication is carried out between a stream recording and playback apparatus and another recording apparatus to interchange a key for data scramble. By using this key, data is added with copy control information used when the data is recorded initially and thereafter the data is transmitted. After the data has been recorded on the recording apparatus, the data is deleted from an original recording medium. During transmission of the data, authentication from a different apparatus is rejected to prevent a plurality of copies from being made.

[Selected Drawing] Fig. 1